SEQUENCE LISTING

<110> Karras, James G

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<170> PatentIn Ver. 2.1

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gctaggttgt ttctgtgggt gccttatcag ggctgggata cttctgattc tggcttcctt 74400
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<213> H. sapiens

<220>
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<400> 154
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ccgagggaac aagccccaac cggatcctgg acaggcaccc cggcttggcg ctgtctctcc 120
ccctcggctc ggagaggccc ttcggcctga gggagcctcg ccgcccgtcc cggcacacg  180
cgcagccccg gcctctcggc ctctgccgga gaaacagttg ggaccctga ttttagcagg 240
atg gcc caa tgg aat cag cta cag cag ctt gac aca cgg tac ctg gag  288
Met Ala Gln Trp Asn Gln Leu Gln Gln Leu Asp Thr Arg Tyr Leu Glu
 1               5                  10                  15

cag ctc cat cag ctc tac agt gac agc ttc cca atg gag ctg cgg cag  336
```

```
      Gln Leu His Gln Leu Tyr Ser Asp Ser Phe Pro Met Glu Leu Arg Gln
               20                  25              30

ttt ctg gcc cct tgg att gag agt caa gat tgg gca tat gcg gcc agc     384
Phe Leu Ala Pro Trp Ile Glu Ser Gln Asp Trp Ala Tyr Ala Ala Ser
         35                  40                  45

aaa gaa tca cat gcc act ttg gtg ttt cat aat ctc ctg gga gag att     432
Lys Glu Ser His Ala Thr Leu Val Phe His Asn Leu Leu Gly Glu Ile
     50                  55                  60

gac cag cag tat agc cgc ttc ctg caa gag tcg aat gtt ctc tat cag     480
Asp Gln Gln Tyr Ser Arg Phe Leu Gln Glu Ser Asn Val Leu Tyr Gln
 65                  70                  75                  80

cac aat cta cga aga atc aag cag ttt ctt cag agc agg tat ctt gag     528
His Asn Leu Arg Arg Ile Lys Gln Phe Leu Gln Ser Arg Tyr Leu Glu
                 85                  90                  95

aag cca atg gag att gcc cgg att gtg gcc cgg tgc ctg tgg gaa gaa     576
Lys Pro Met Glu Ile Ala Arg Ile Val Ala Arg Cys Leu Trp Glu Glu
                100                 105                 110

tca cgc ctt cta cag act gca gcc act gcg gcc cag caa ggg ggc cag     624
Ser Arg Leu Leu Gln Thr Ala Ala Thr Ala Ala Gln Gln Gly Gly Gln
         115                 120                 125

gcc aac cac ccc aca gca gcc gtg gtg acg gag aag cag cag atg ctg     672
Ala Asn His Pro Thr Ala Ala Val Val Thr Glu Lys Gln Gln Met Leu
     130                 135                 140

gag cag cac ctt cag gat gtc cgg aag aga gtg cag gat cta gaa cag     720
Glu Gln His Leu Gln Asp Val Arg Lys Arg Val Gln Asp Leu Glu Gln
145                 150                 155                 160

aaa atg aaa gtg gta gag aat ctc cag gat gac ttt gat ttc aac tat     768
Lys Met Lys Val Val Glu Asn Leu Gln Asp Asp Phe Asp Phe Asn Tyr
                165                 170                 175

aaa acc ctc aag agt caa gga gac atg caa gat ctg aat gga aac aac     816
Lys Thr Leu Lys Ser Gln Gly Asp Met Gln Asp Leu Asn Gly Asn Asn
                180                 185                 190

cag tca gtg acc agg cag aag atg cag cag ctg gaa cag atg ctc act     864
Gln Ser Val Thr Arg Gln Lys Met Gln Gln Leu Glu Gln Met Leu Thr
         195                 200                 205

gcg ctg gac cag atg cgg aga agc atc gtg agt gag ctg gcg ggg ctt     912
Ala Leu Asp Gln Met Arg Arg Ser Ile Val Ser Glu Leu Ala Gly Leu
     210                 215                 220

ttg tca gcg atg gag tac gtg cag aaa act ctc acg gac gag gag ctg     960
Leu Ser Ala Met Glu Tyr Val Gln Lys Thr Leu Thr Asp Glu Glu Leu
225                 230                 235                 240

gct gac tgg aag agg cgg caa cag att gcc tgc att gga ggc ccg ccc    1008
Ala Asp Trp Lys Arg Arg Gln Gln Ile Ala Cys Ile Gly Gly Pro Pro
                245                 250                 255

aac atc tgc cta gat cgg cta gaa aac tgg ata acg tca tta gca gaa    1056
Asn Ile Cys Leu Asp Arg Leu Glu Asn Trp Ile Thr Ser Leu Ala Glu
                260                 265                 270

tct caa ctt cag acc cgt caa caa att aag aaa ctg gag gag ttg cag    1104
Ser Gln Leu Gln Thr Arg Gln Gln Ile Lys Lys Leu Glu Glu Leu Gln
         275                 280                 285

caa aaa gtt tcc tac aaa ggg gac ccc att gta cag cac cgg ccg atg    1152
```

```
       Gln Lys Val Ser Tyr Lys Gly Asp Pro Ile Val Gln His Arg Pro Met
           290             295             300

ctg gag gag aga atc gtg gag ctg ttt aga aac tta atg aaa agt gcc     1200
Leu Glu Glu Arg Ile Val Glu Leu Phe Arg Asn Leu Met Lys Ser Ala
305             310             315             320

ttt gtg gtg gag cgg cag ccc tgc atg ccc atg cat cct gac cgg ccc     1248
Phe Val Val Glu Arg Gln Pro Cys Met Pro Met His Pro Asp Arg Pro
                325             330             335

ctc gtc atc aag acc ggc gtc cag ttc act act aaa gtc agg ttg ctg     1296
Leu Val Ile Lys Thr Gly Val Gln Phe Thr Thr Lys Val Arg Leu Leu
                340             345             350

gtc aaa ttc cct gag ttg aat tat cag ctt aaa att aaa gtg tgc att     1344
Val Lys Phe Pro Glu Leu Asn Tyr Gln Leu Lys Ile Lys Val Cys Ile
                355             360             365

gac aaa gac tct ggg gac gtt gca gct ctc aga gga tcc cgg aaa ttt     1392
Asp Lys Asp Ser Gly Asp Val Ala Ala Leu Arg Gly Ser Arg Lys Phe
           370             375             380

aac att ctg ggc aca aac aca aaa gtg atg aac atg gaa gaa tcc aac     1440
Asn Ile Leu Gly Thr Asn Thr Lys Val Met Asn Met Glu Glu Ser Asn
385             390             395             400

aac ggc agc ctc tct gca gaa ttc aaa cac ttg acc ctg agg gag cag     1488
Asn Gly Ser Leu Ser Ala Glu Phe Lys His Leu Thr Leu Arg Glu Gln
                405             410             415

aga tgt ggg aat ggg ggc cga gcc aat tgt gat gct tcc ctg att gtg     1536
Arg Cys Gly Asn Gly Gly Arg Ala Asn Cys Asp Ala Ser Leu Ile Val
                420             425             430

act gag gag ctg cac ctg atc acc ttt gag acc gag gtg tat cac caa     1584
Thr Glu Glu Leu His Leu Ile Thr Phe Glu Thr Glu Val Tyr His Gln
           435             440             445

ggc ctc aag att gac cta gag acc cac tcc ttg cca gtt gtg gtg atc     1632
Gly Leu Lys Ile Asp Leu Glu Thr His Ser Leu Pro Val Val Val Ile
           450             455             460

tcc aac atc tgt cag atg cca aat gcc tgg gcg tcc atc ctg tgg tac     1680
Ser Asn Ile Cys Gln Met Pro Asn Ala Trp Ala Ser Ile Leu Trp Tyr
465             470             475             480

aac atg ctg acc aac aat ccc aag aat gta aac ttt ttt acc aag ccc     1728
Asn Met Leu Thr Asn Asn Pro Lys Asn Val Asn Phe Phe Thr Lys Pro
                485             490             495

cca att gga acc tgg gat caa gtg gcc gag gtc ctg agc tgg cag ttc     1776
Pro Ile Gly Thr Trp Asp Gln Val Ala Glu Val Leu Ser Trp Gln Phe
                500             505             510

tcc tcc acc acc aag cga gga ctg agc atc gag cag ctg act aca ctg     1824
Ser Ser Thr Thr Lys Arg Gly Leu Ser Ile Glu Gln Leu Thr Thr Leu
                515             520             525

gca gag aaa ctc ttg gga cct ggt gtg aat tat tca ggg tgt cag atc     1872
Ala Glu Lys Leu Leu Gly Pro Gly Val Asn Tyr Ser Gly Cys Gln Ile
           530             535             540

aca tgg gct aaa ttt tgc aaa gaa aac atg gct ggc aag ggc ttc tcc     1920
Thr Trp Ala Lys Phe Cys Lys Glu Asn Met Ala Gly Lys Gly Phe Ser
545             550             555             560

ttc tgg gtc tgg ctg gac aat atc att gac ctt gtg aaa aag tac atc     1968
```

```
Phe Trp Val Trp Leu Asp Asn Ile Ile Asp Leu Val Lys Lys Tyr Ile
            565                 570                 575
```

```
ctg gcc ctt tgg aac gaa ggg tac atc atg ggc ttt atc agt aag gag   2016
Leu Ala Leu Trp Asn Glu Gly Tyr Ile Met Gly Phe Ile Ser Lys Glu
            580                 585                 590
```

```
cgg gag cgg gcc atc ttg agc act aag cct cca ggc acc ttc ctg cta   2064
Arg Glu Arg Ala Ile Leu Ser Thr Lys Pro Pro Gly Thr Phe Leu Leu
            595                 600                 605
```

```
aga ttc agt gaa agc agc aaa gaa gga ggc gtc act ttc act tgg gtg   2112
Arg Phe Ser Glu Ser Ser Lys Glu Gly Gly Val Thr Phe Thr Trp Val
        610                 615                 620
```

```
gag aag gac atc agc ggt aag acc cag atc cag tcc gtg gaa cca tac   2160
Glu Lys Asp Ile Ser Gly Lys Thr Gln Ile Gln Ser Val Glu Pro Tyr
625                 630                 635                 640
```

```
aca aag cag cag ctg aac aac atg tca ttt gct gaa atc atc atg ggc   2208
Thr Lys Gln Gln Leu Asn Asn Met Ser Phe Ala Glu Ile Ile Met Gly
                645                 650                 655
```

```
tat aag atc atg gat gct acc aat atc ctg gtg tct cca ctg gtc tat   2256
Tyr Lys Ile Met Asp Ala Thr Asn Ile Leu Val Ser Pro Leu Val Tyr
                660                 665                 670
```

```
ctc tat cct gac att ccc aag gag gag gca ttc gga aag tat tgt cgg   2304
Leu Tyr Pro Asp Ile Pro Lys Glu Glu Ala Phe Gly Lys Tyr Cys Arg
            675                 680                 685
```

```
cca gag agc cag gag cat cct gaa gct gac cca ggt agc gct gcc cca   2352
Pro Glu Ser Gln Glu His Pro Glu Ala Asp Pro Gly Ser Ala Ala Pro
        690                 695                 700
```

```
tac ctg aag acc aag ttt atc tgt gtg aca cca acg acc tgc agc aat   2400
Tyr Leu Lys Thr Lys Phe Ile Cys Val Thr Pro Thr Thr Cys Ser Asn
705                 710                 715                 720
```

```
acc att gac ctg ccg atg tcc ccc cgc act tta gat tca ttg atg cag   2448
Thr Ile Asp Leu Pro Met Ser Pro Arg Thr Leu Asp Ser Leu Met Gln
                725                 730                 735
```

```
ttt gga aat aat ggt gaa ggt gct gaa ccc tca gca gga ggg cag ttt   2496
Phe Gly Asn Asn Gly Glu Gly Ala Glu Pro Ser Ala Gly Gly Gln Phe
                740                 745                 750
```

```
gag tcc ctc acc ttt gac atg gag ttg acc tcg gag tgc gct acc tcc   2544
Glu Ser Leu Thr Phe Asp Met Glu Leu Thr Ser Glu Cys Ala Thr Ser
            755                 760                 765
```

```
ccc atg tga ggagctgaga acggaagctg cagaaagata cgactgaggc           2593
Pro Met  *
        770
```

```
gcctacctgc attctgccac ccctcacaca gccaaacccc agatcatctg aaactactaa 2653
cttttgtggtt ccagatttt tttaatctcc tacttctgct atctttgagc aatctgggca 2713
cttttaaaaa tagagaaatg agtgaatgtg ggtgatctgc ttttatctaa atgcaaataa 2773
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aacttaagca gccgggcatg gtggctcacg cctgtaatcc cagcactttg ggaggccgag 3193
gcggatcata aggtcaggag atcaagacca tcctggctaa cacggtgaaa ccccgtctct 3253
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ggaggctgag gcaggagaat cgcttgaacc tgagaggcgg aggttgcagt gagccaaaat 3373
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```
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aaaaaaaaaa aaaaaaaaaa aa                                          3455
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```

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ttgggccatc ctgctaaaat                                                    20

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attcacttgc ctccttgact                                                    20

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ctgaacttac cctctgagag                                                    20

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cttgttccct cggctgcgac   20

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gaagggcctc tccgagccga   20

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ggcggcgagg ctccctcagg   20

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agaaactgct tgattcttcg   20

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ggccagtcgg gcctcagccc cggagacagt cgagacccct gactgcagca gg atg gct 178
                                                         Met Ala
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cag tgg aac cag ctg cag cag ctg gac aca cgc tac ctg gag cag ctg    226
Gln Trp Asn Gln Leu Gln Gln Leu Asp Thr Arg Tyr Leu Glu Gln Leu
         5                   10                  15

cac cag ctg tac agc gac acg ttc ccc atg gag ctg cgg cag ttc ctg    274
His Gln Leu Tyr Ser Asp Thr Phe Pro Met Glu Leu Arg Gln Phe Leu
    20                  25                  30

gca cct tgg att gag agt caa gac tgg gca tat gca gcc agc aaa gag    322
Ala Pro Trp Ile Glu Ser Gln Asp Trp Ala Tyr Ala Ala Ser Lys Glu
35                  40                  45                  50

tca cat gcc acg ttg gtg ttt cat aat ctc ttg ggt gaa att gac cag    370
Ser His Ala Thr Leu Val Phe His Asn Leu Leu Gly Glu Ile Asp Gln
             55                  60                  65

caa tat agc cga ttc ctg caa gag tcc aat gtc ctc tat cag cac aac    418
Gln Tyr Ser Arg Phe Leu Gln Glu Ser Asn Val Leu Tyr Gln His Asn
         70                  75                  80

ctt cga aga atc aag cag ttt ctg cag agc agg tat ctt gag aag cca    466
Leu Arg Arg Ile Lys Gln Phe Leu Gln Ser Arg Tyr Leu Glu Lys Pro
         85                  90                  95

atg gaa att gcc cgg atc gtg gcc cga tgc ctg tgg gaa gag tct cgc    514
Met Glu Ile Ala Arg Ile Val Ala Arg Cys Leu Trp Glu Glu Ser Arg
    100                 105                 110

ctc ctc cag acg gca gcc acg gca gcc cag caa ggg ggc cag gcc aac    562
Leu Leu Gln Thr Ala Ala Thr Ala Ala Gln Gln Gly Gly Gln Ala Asn
115                 120                 125                 130

cac cca aca gcc gcc gta gtg aca gag aag cag cag atg ttg gag cag    610
His Pro Thr Ala Ala Val Val Thr Glu Lys Gln Gln Met Leu Glu Gln
             135                 140                 145

cat ctt cag gat gtc cgg aag cga gtg cag gat cta gaa cag aaa atg    658
His Leu Gln Asp Val Arg Lys Arg Val Gln Asp Leu Glu Gln Lys Met
             150                 155                 160

aag gtg gtg gag aac ctc cag gac gac ttt gat ttc aac tac aaa acc    706
Lys Val Val Glu Asn Leu Gln Asp Asp Phe Asp Phe Asn Tyr Lys Thr
             165                 170                 175

ctc aag agc caa gga gac atg cag gat ctg aat gga aac aac cag tct    754
Leu Lys Ser Gln Gly Asp Met Gln Asp Leu Asn Gly Asn Asn Gln Ser
    180                 185                 190

gtg acc aga cag aag atg cag cag ctg gaa cag atg ctc aca gcc ctg    802
Val Thr Arg Gln Lys Met Gln Gln Leu Glu Gln Met Leu Thr Ala Leu
195                 200                 205                 210

gac cag atg cgg aga agc att gtg agt gag ctg gcg ggg ctc ttg tca    850
Asp Gln Met Arg Arg Ser Ile Val Ser Glu Leu Ala Gly Leu Leu Ser
                    215                 220                 225

gca atg gag tac gtg cag aag aca ctg act gat gaa gag ctg gct gac    898
Ala Met Glu Tyr Val Gln Lys Thr Leu Thr Asp Glu Glu Leu Ala Asp
             230                 235                 240

tgg aag agg cgg cag cag atc gcg tgc atc gga ggc cct ccc aac atc    946
Trp Lys Arg Arg Gln Gln Ile Ala Cys Ile Gly Gly Pro Pro Asn Ile
         245                 250                 255

tgc ctg gac cgt ctg gaa aac tgg ata act tca tta gca gaa tct caa    994
Cys Leu Asp Arg Leu Glu Asn Trp Ile Thr Ser Leu Ala Glu Ser Gln
260                 265                 270
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gtg tcc tac aag ggc gac cct atc gtg cag cac cgg ccc atg ctg gag    1090
Val Ser Tyr Lys Gly Asp Pro Ile Val Gln His Arg Pro Met Leu Glu
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gag agg atc gtg gag ctg ttc aga aac tta atg aag agt gcc ttc gtg    1138
Glu Arg Ile Val Glu Leu Phe Arg Asn Leu Met Lys Ser Ala Phe Val
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gtg gag cgg cag ccc tgc atg ccc atg cac ccg gac cgg ccc tta gtc    1186
Val Glu Arg Gln Pro Cys Met Pro Met His Pro Asp Arg Pro Leu Val
            325             330             335

atc aag act ggt gtc cag ttt acc acg aaa gtc agg ttg ctg gtc aaa    1234
Ile Lys Thr Gly Val Gln Phe Thr Thr Lys Val Arg Leu Leu Val Lys
            340             345             350

ttt cct gag ttg aat tat cag ctt aaa att aaa gtg tgc att gat aaa    1282
Phe Pro Glu Leu Asn Tyr Gln Leu Lys Ile Lys Val Cys Ile Asp Lys
355             360             365             370

gac tct ggg gat gtt gct gcc ctc aga ggg tct cgg aaa ttt aac att    1330
Asp Ser Gly Asp Val Ala Ala Leu Arg Gly Ser Arg Lys Phe Asn Ile
                375             380             385

ctg ggc acg aac aca aaa gtg atg aac atg gag gag tct aac aac ggc    1378
Leu Gly Thr Asn Thr Lys Val Met Asn Met Glu Glu Ser Asn Asn Gly
            390             395             400

agc ctg tct gca gag ttc aag cac ctg acc ctt agg gag cag aga tgt    1426
Ser Leu Ser Ala Glu Phe Lys His Leu Thr Leu Arg Glu Gln Arg Cys
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ggg aat gga ggc cgt gcc aat tgt gat gcc tcc ttg atc gtg act gag    1474
Gly Asn Gly Gly Arg Ala Asn Cys Asp Ala Ser Leu Ile Val Thr Glu
            420             425             430

gag ctg cac ctg atc acc ttc gag act gag gtg tac cac caa ggc ctc    1522
Glu Leu His Leu Ile Thr Phe Glu Thr Glu Val Tyr His Gln Gly Leu
435             440             445             450

aag att gac cta gag acc cac tcc ttg cca gtt gtg gtg atc tcc aac    1570
Lys Ile Asp Leu Glu Thr His Ser Leu Pro Val Val Val Ile Ser Asn
                455             460             465

atc tgt cag atg cca aat gct tgg gca tca atc ctg tgg tat aac atg    1618
Ile Cys Gln Met Pro Asn Ala Trp Ala Ser Ile Leu Trp Tyr Asn Met
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ctg acc aat aac ccc aag aac gtg aac ttc ttc act aag ccg cca att    1666
Leu Thr Asn Asn Pro Lys Asn Val Asn Phe Phe Thr Lys Pro Pro Ile
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gga acc tgg gac caa gtg gcc gag gtg ctc agc tgg cag ttc tcg tcc    1714
Gly Thr Trp Asp Gln Val Ala Glu Val Leu Ser Trp Gln Phe Ser Ser
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acc acc aag cga ggg ctg agc atc gag cag ctg aca acg ctg gct gag    1762
Thr Thr Lys Arg Gly Leu Ser Ile Glu Gln Leu Thr Thr Leu Ala Glu
515             520             525             530

aag ctc cta ggg cct ggt gtg aac tac tca ggg tgt cag atc aca tgg    1810
Lys Leu Leu Gly Pro Gly Val Asn Tyr Ser Gly Cys Gln Ile Thr Trp
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Ala Lys Phe Cys Lys Glu Asn Met Ala Gly Lys Gly Phe Ser Phe Trp
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Val Trp Leu Asp Asn Ile Ile Asp Leu Val Lys Lys Tyr Ile Leu Ala
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ctt tgg aat gaa ggg tac atc atg ggt ttc atc agc aag gag cgg gag   1954
Leu Trp Asn Glu Gly Tyr Ile Met Gly Phe Ile Ser Lys Glu Arg Glu
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cgg gcc atc cta agc aca aag ccc ccg ggc acc ttc cta ctg cgc ttc   2002
Arg Ala Ile Leu Ser Thr Lys Pro Pro Gly Thr Phe Leu Leu Arg Phe
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agc gag agc agc aaa gaa gga ggg gtc act ttc act tgg gtg gaa aag   2050
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gac atc agt ggc aag acc cag atc cag tct gta gag cca tac acc aag   2098
Asp Ile Ser Gly Lys Thr Gln Ile Gln Ser Val Glu Pro Tyr Thr Lys
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Gln Gln Leu Asn Asn Met Ser Phe Ala Glu Ile Ile Met Gly Tyr Lys
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atc atg gat gcg acc aac atc ctg gtg tct cca ctt gtc tac ctc tac   2194
Ile Met Asp Ala Thr Asn Ile Leu Val Ser Pro Leu Val Tyr Leu Tyr
660             665             670

ccc gac att ccc aag gag gag gca ttt gga aag tac tgt agg ccc gag   2242
Pro Asp Ile Pro Lys Glu Glu Ala Phe Gly Lys Tyr Cys Arg Pro Glu
675             680             685             690

agc cag gag cac ccc gaa gcc gac cca ggt agt gct gcc ccg tac ctg   2290
Ser Gln Glu His Pro Glu Ala Asp Pro Gly Ser Ala Ala Pro Tyr Leu
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aag acc aag ttc atc tgt gtg aca cca ttc att gat gca gtt tgg aaa   2338
Lys Thr Lys Phe Ile Cys Val Thr Pro Phe Ile Asp Ala Val Trp Lys
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taa cggtgaaggt gctgagccct cagcaggagg gcagtttgag tcgctcacgt       2391
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